PRE–AP ALGEBRA 2

3A.6 CLASSWORK

1) Let $y = f(x) = \log_2 x$, $y = g(x) = \log_2 x + 3$ and $y = h(x) = \log_2 x - 3$.

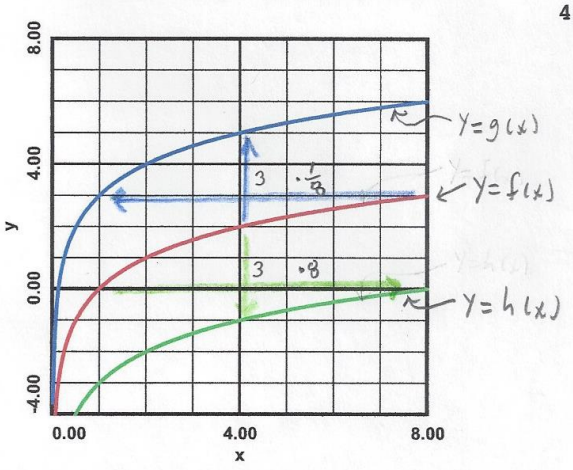
a) Describe the translation that takes $y = f(x)$ to $y = g(x)$.

b) Describe the translation that takes $y = f(x)$ to $y = h(x)$.

c) Write $y = g(x)$ as a horizontal compression of $y = f(x)$. Explain the compression in words.

d) Write $y = h(x)$ as a horizontal stretch of $y = f(x)$. Explain the stretch in words.

e) Graph $y = f(x)$, $y = g(x)$ and $y = h(x)$ on the axes below. Indicate the translations, compression and stretch on the graph.



(a) $g(x) = \log_2 x + 3 = f(x) + 3$ is a translation of $y = f(x)$ by 3 up.

(b) $h(x) = \log_2 x - 3 = f(x) - 3$ is a translation of $y = f(x)$ by 3 down.

(c) $3 = \log_2 w$, $2^3 = 2^{\log_2 w}$, $w = 2^3 = 8$, $3 = \log_2 8$

$g(x) = \log_2 x + 3 = \log_2 x + \log_2 y = \log_2 (8x)$

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2) Describe the transformation that takes $y = f(x) = \ln x$ to $y = g(x) = \ln \sqrt[3]{x+1} - 8$.

$g(x) = \ln (x+1)^{1/3} - 8 = \frac{1}{3} \ln (x+1) - 8 = \frac{1}{3} f(x+1) - 8$

Vertically compress $y = f(x)$ by a factor of $\frac{1}{3}$, then translate 1 left and 8 down.

3) Let $y = f(x) = \log_7 x$.

a) Write $y = g(x) = \log_7 x^2$ as a vertical stretch of $y = f(x)$. Explain the stretch in words.

b) Write $y = h(x) = \log_7 \sqrt{x}$ as a vertical compression of $y = f(x)$. Explain the compression in words.

(a) $y = g(x) = \log_7 x^2 = 2 \log_7 x = 2 f(x)$

which is a vertical stretch, by a factor of 2, of $y = f(x)$.

(b) $y = h(x) = \log_7 \sqrt{x} = \log_7 x^{1/2} = \frac{1}{2} \log_7 x = \frac{1}{2} f(x)$

which is a vertical compression, by a factor of $\frac{1}{2}$, of $y = f(x)$.

4) Let $y = f(x) = -\log_3 (x - 2) + 5$.

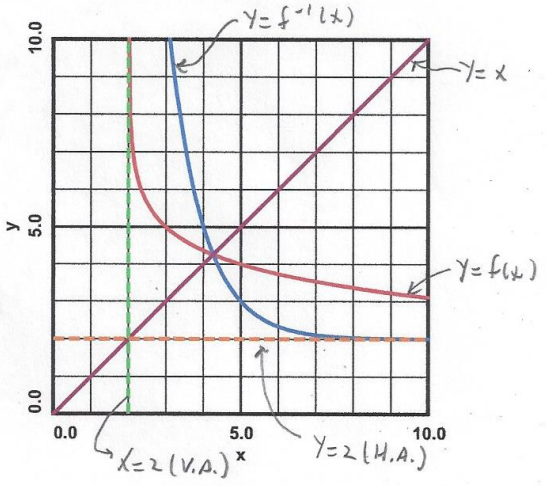
a) Graph $y = x$ on the axes below.

b) Graph $y = f(x)$ on the axes below. Indicate the vertical asymptote (V.A.) of $y = f(x)$ on the graph.

c) Calculate $y = f^{-1}(x)$.

d) Graph $y = f^{-1}(x)$ on the axes below. Indicate the horizontal asymptote (H.A.) of $y = f^{-1}(x)$ on the graph.

e) State the domain and range of both $y = f(x)$ and $y = f^{-1}(x)$.



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1) c) which is a horizontal compression, by a factor of $\frac{1}{8}$, of $y=f(x)$

d) $y=h(x)=\log_2 x-3=\log_2 x-\log_2 8=\log_2\left(\frac{x}{8}\right)$

which is a horizontal stretch, by a factor of 8, of $y=f(x)$

4) c) $y=f(x)=-\log_3(x-2)+5$, $x=-\log_3(y-2)+5$, $-\log_3(y-2)=x-5$,

$\log_3(y-2)=5-x$, $3^{\log_3(y-2)}=3^{5-x}$, $y-2=3^{5-x}$,

$y=f^{-1}(x)=3^{5-x}+2$

e) $y=f(x)$ domain: $2<x<\infty$ range: $-\infty<y<\infty$

$y=f^{-1}(x)$ domain: $-\infty<x<\infty$ range: $2<y<\infty$